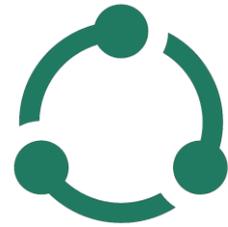


Blockchain for State Governments



Virginia JCOTS Blockchain Committee
November 8, 2018

Nikhil Shenoy



Colvin Run



GBA



CIT
CENTER FOR INNOVATIVE TECHNOLOGY



THE LEADER IN MANAGED SECURITY

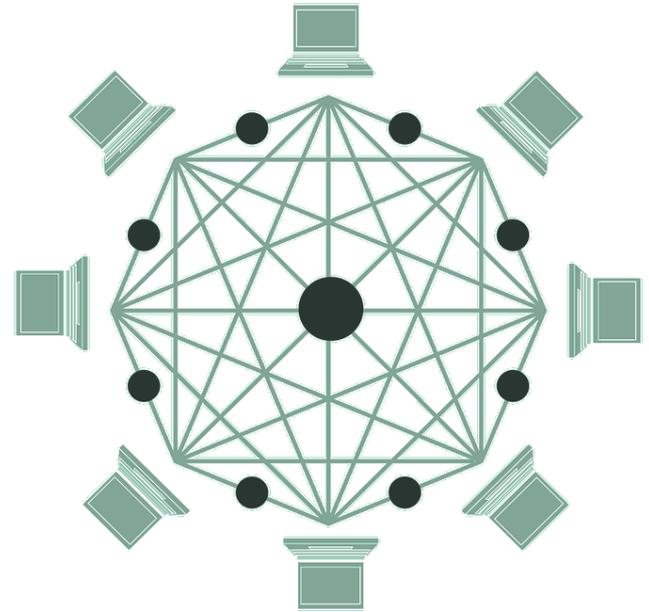


Massachusetts
Institute of
Technology

Blockchain 101



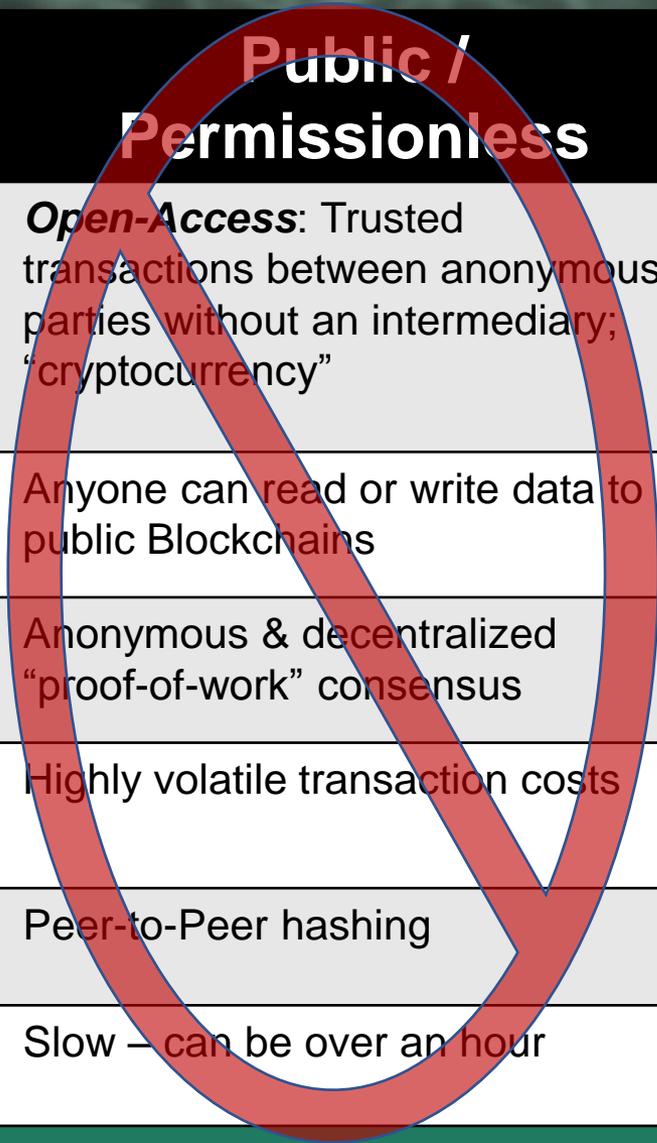
Bitcoin is the first decentralized digital currency without a central bank.



Blockchain is a distributed data structure, where transaction records are stored and verified by a peer-to-peer network.

Types of Blockchains

	Public / Permissionless	Private / Permissioned
Purpose	Open-Access: Trusted transactions between anonymous parties without an intermediary; “cryptocurrency”	Enterprise Applications: Trusted transactions between known parties with established regulations but possibly competing incentives
Privacy	Anyone can read or write data to public Blockchains	Participants are given permission & pre-approved, similar to databases
Verification	Anonymous & decentralized “proof-of-work” consensus	Pre-approved rules & methods governed by mutually agreed parties
Costs	Highly volatile transaction costs	Inexpensive or nearly free operation
Immutability	Peer-to-Peer hashing	Peer-to-Peer consensus
Speed	Slow – can be over an hour	Varies, generally faster than public, can be within minutes



What is Decentralization?

Digital Transaction: Ledger



Decentralized Ledger

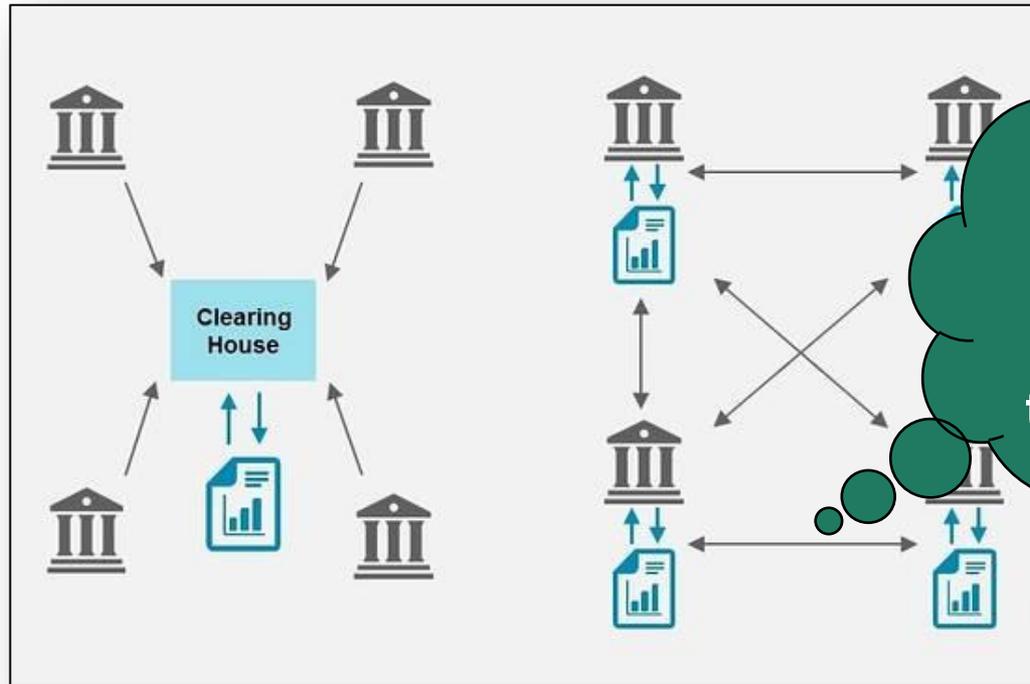


CBInsights, "What is Blockchain Technology?"

Myth: Removing Intermediaries...

CIO JOURNAL.

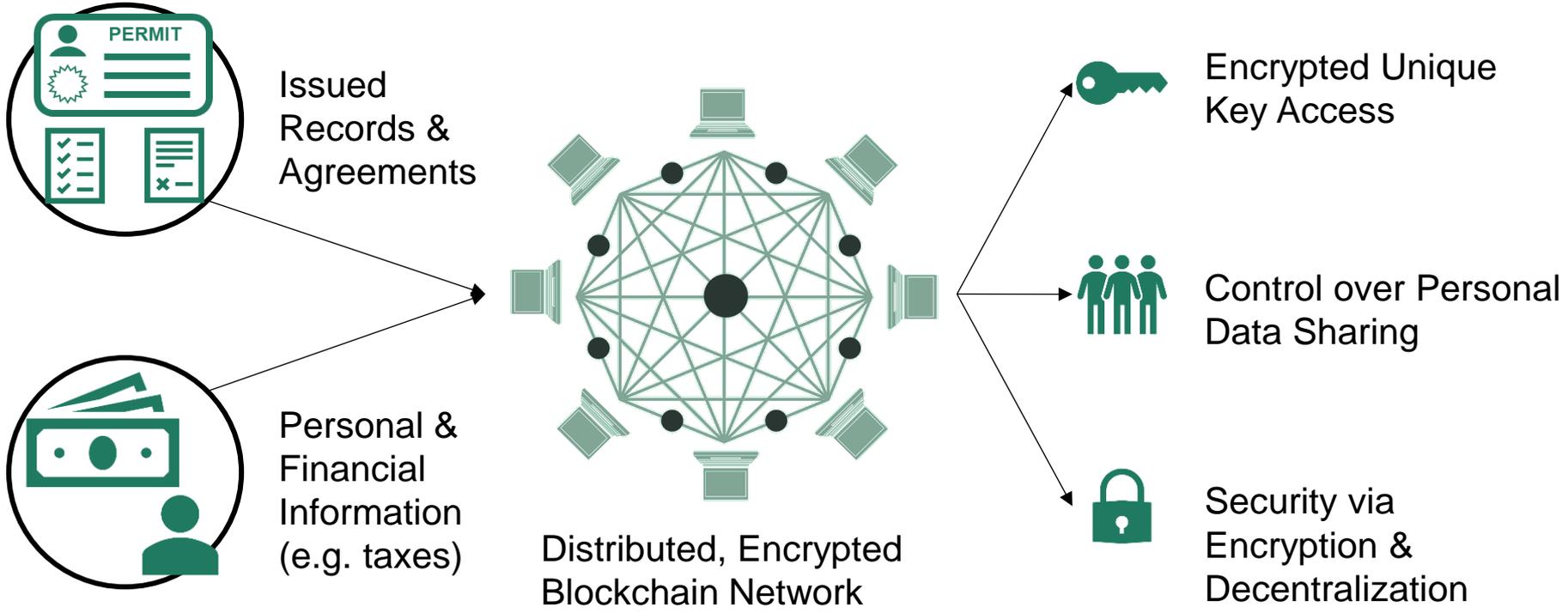
CIO Explainer: What Is Blockchain?



Someone has to facilitate & govern all this activity!

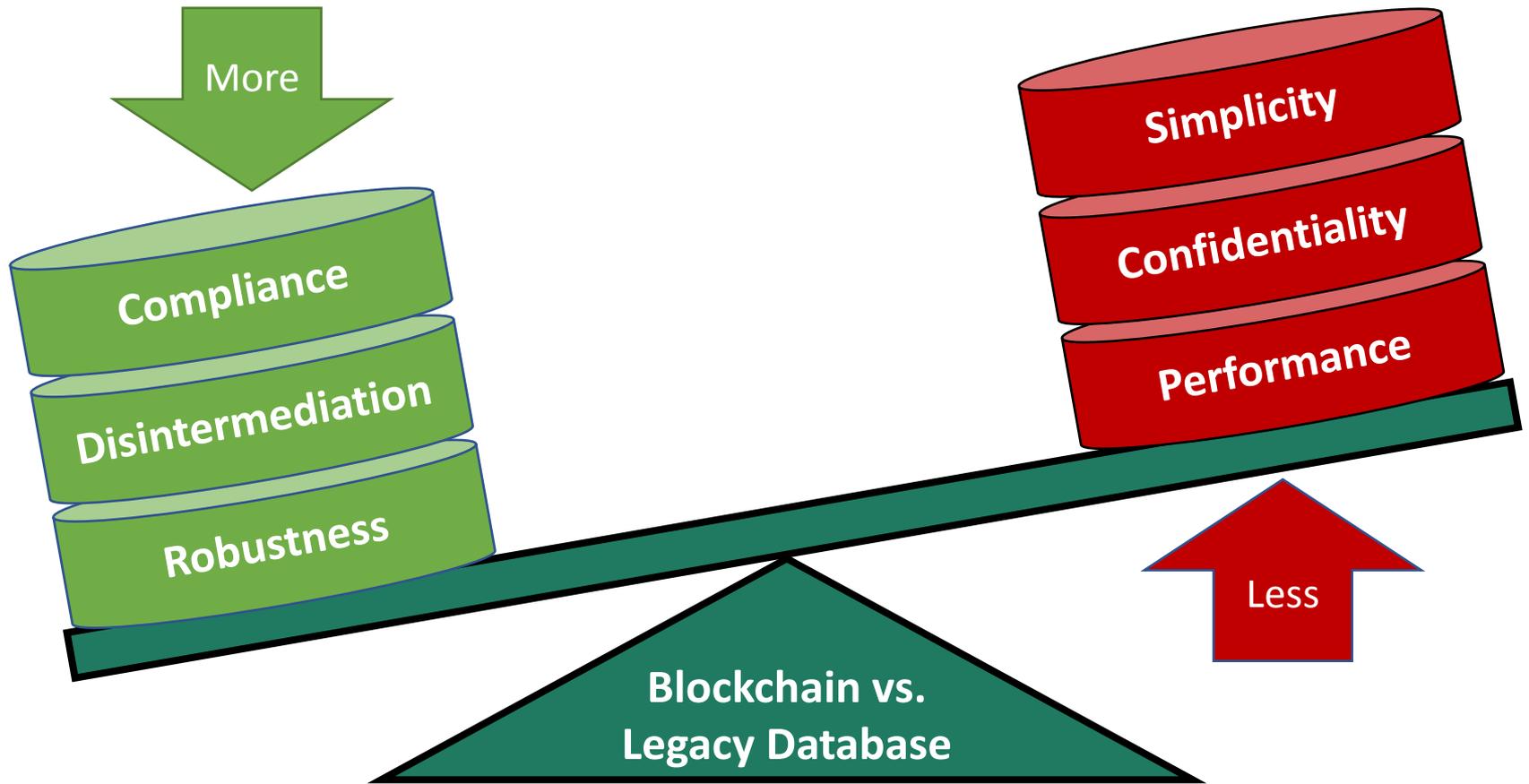
<https://blogs.wsj.com/cio/2016/02/02/cio-explainer-what-is-blockchain/>

Fact: *Changes Intermediation Itself*



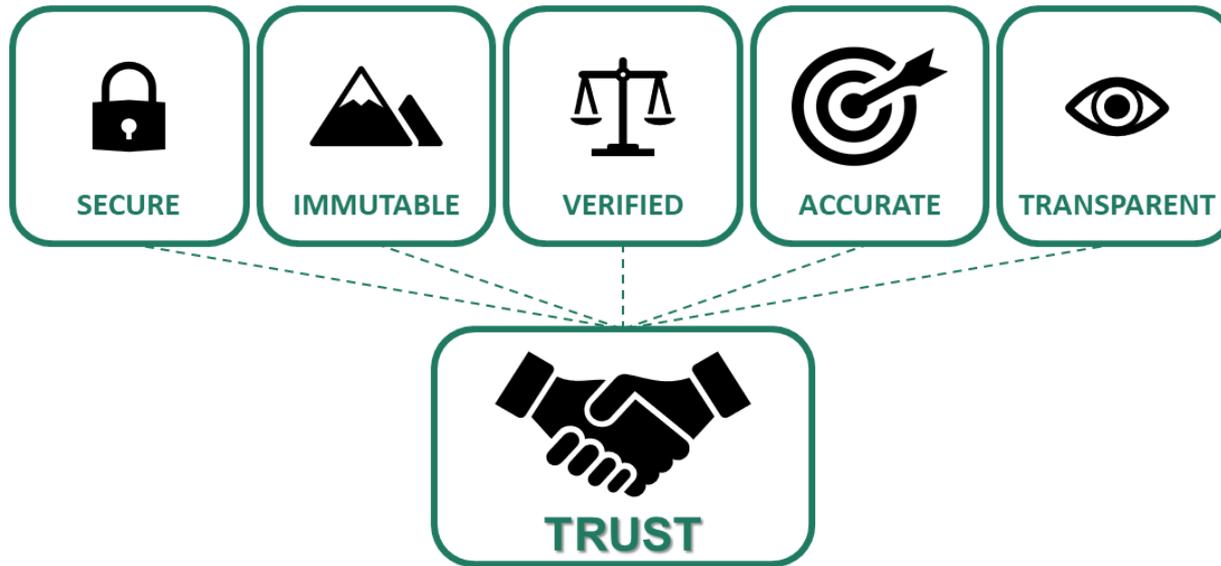
Aggregation → Facilitation

Blockchain vs. Legacy Database



Blockchain is a **ledger construct that utilizes database technology** to enable trusted transactions

The Components of Trust



- **Secure:** hashed (encrypted) records are easy to verify given some input, but it's practically impossible to find the input which produces a known or preexisting hash value
- **Immutable:** blockchain systems are significantly more robust and resilient than traditional systems because there is no single point of failure
- **Verified:** consensus mechanisms enable autonomous governance capabilities, so data write access is controlled
- **Accurate:** users have predetermined controls and data access rights, so data is complete, accurate and consistent
- **Transparent:** a single shared ledger to record transactions reduces the clutter and complications of multiple data sources

Blockchain Key Benefits



Saves time

Transaction time from days to near instantaneous



Removes cost

Overheads and cost intermediaries



Reduces risk

Tampering, fraud & cyber crime



Increases trust

Through shared processes and recordkeeping



Recall Efficiency: 7 Days to 3 Seconds

Blockchain Providers Emerging

Microsoft Azure

Why Azure ▾ Solutions **Products** ▾ Documentation Pricing Training Marketplace

Blockchain Workbench PREVIEW

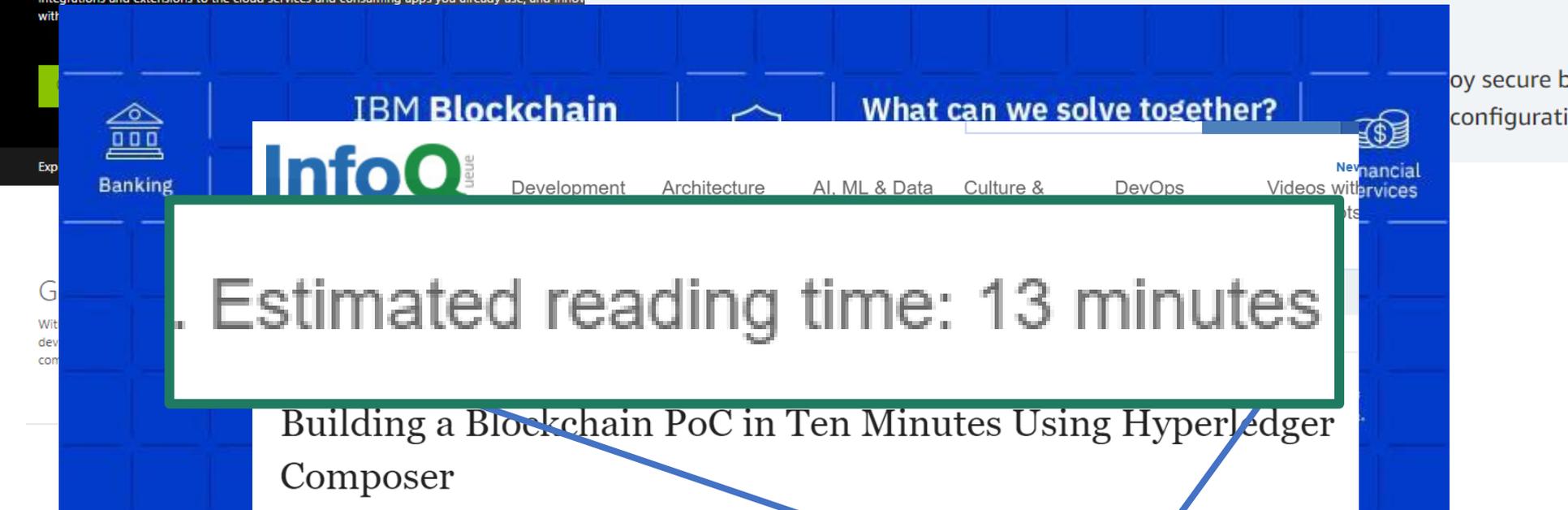
Connect your blockchain to the cloud without the heavy lifting

Quickly start your blockchain projects with Azure Blockchain Workbench. Simplify development and ease experimentation with prebuilt networks and infrastructure. Accelerate time to value through integrations and extensions to the cloud services and consuming apps you already use, and innovate with

Menu  Contact Sales Products ▾ Solutions Pr

Blockchain Overview AWS Blockchain Templates Partners

Deploy blockchain quickly



IBM Blockchain  What can we solve together?

Banking Development Architecture AI, ML & Data Culture & DevOps Videos with financial services

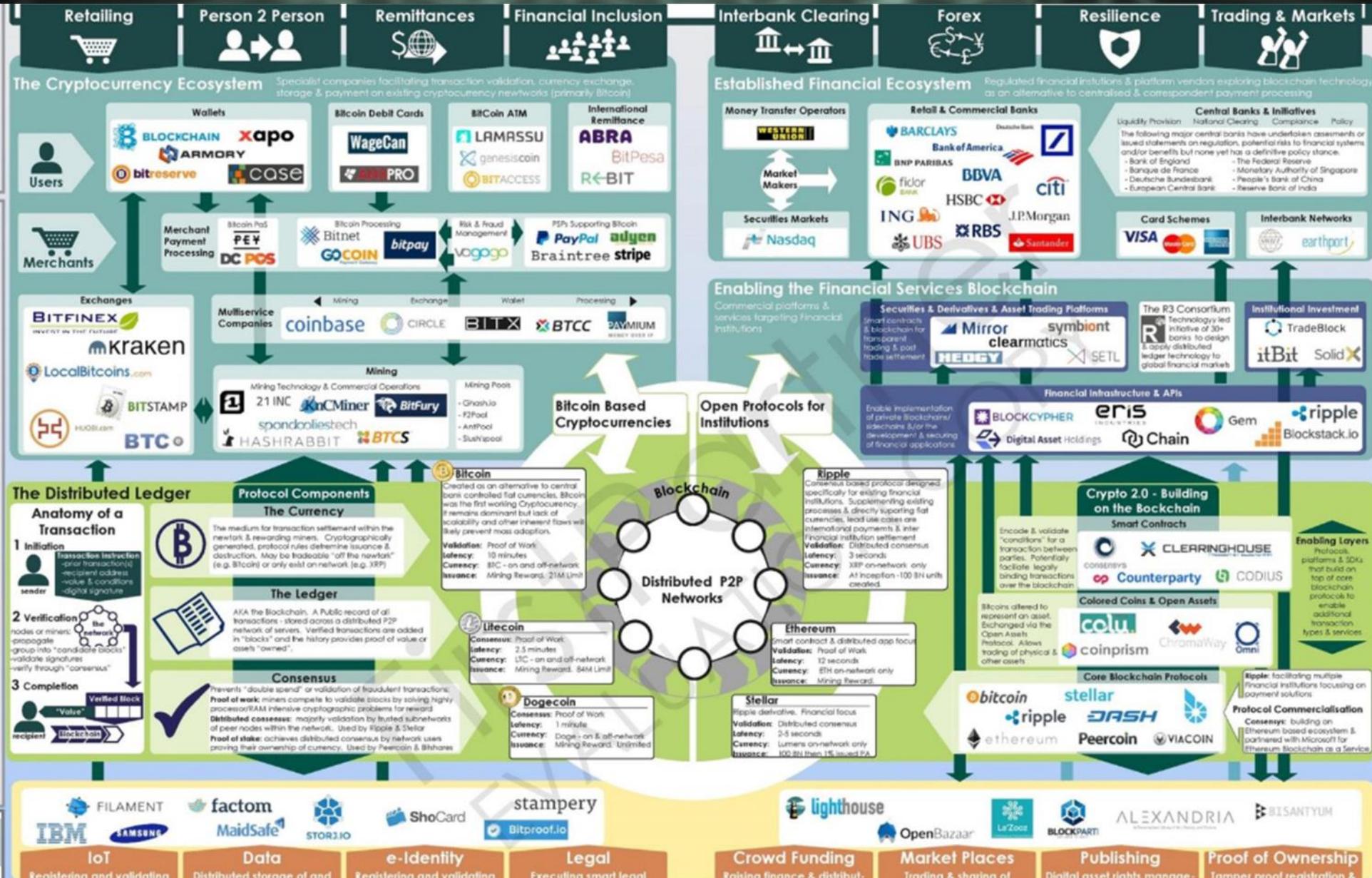
Building a Blockchain PoC in Ten Minutes Using Hyperledger Composer

Estimated reading time: 13 minutes

 | Posted by [Matt Lucas](#), reviewed by [Daniel Bryant](#) on Jun 27, 2017  

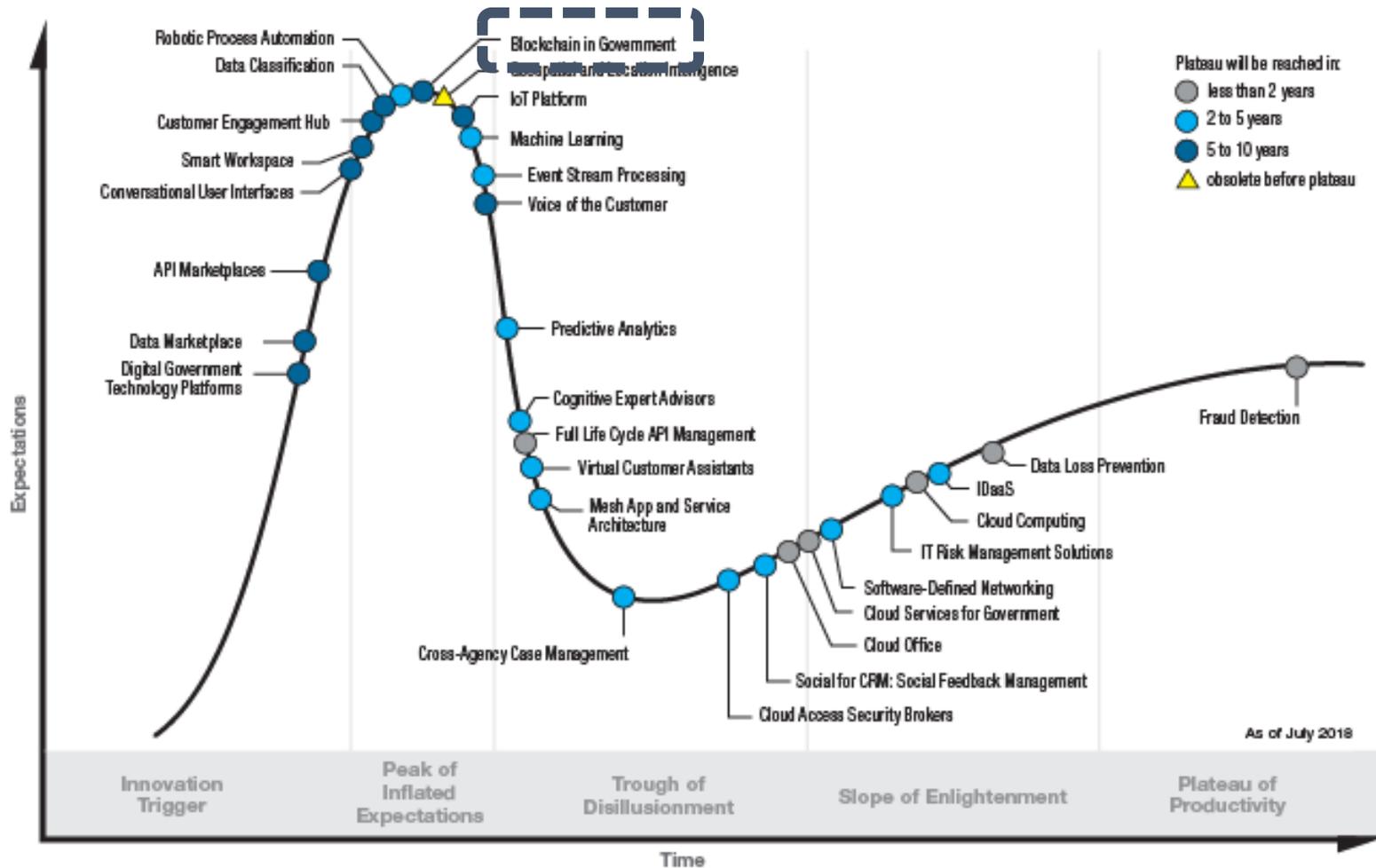
contracts with service bus and Event hubs. Signing, hashing, and routing tools transform messages into the format expected by the blockchain's native API. Synchronize on-chain data with off-chain storage and databases to more easily query attestations and visualize ledger activity.

Blockchain Use Cases Abound...



Government Blockchain in 2018

Hype Cycle for Digital Government Technology, 2018



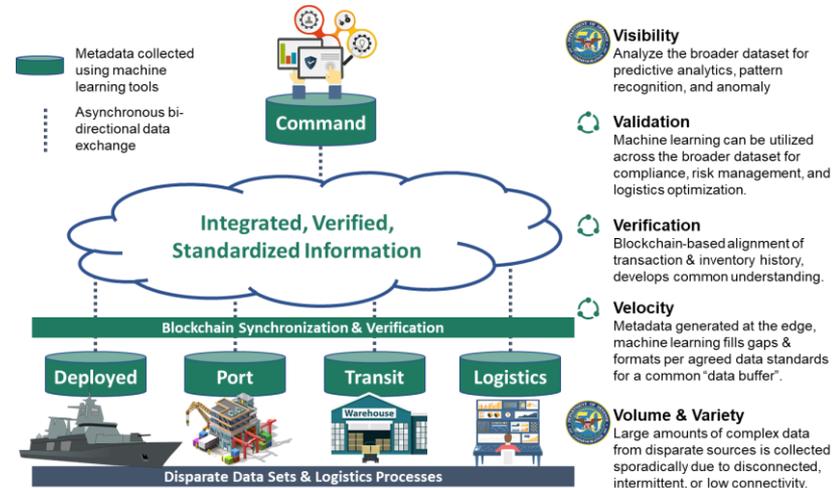
<https://www.gartner.com/smarterwithgartner/top-trends-from-gartner-hype-cycle-for-digital-government-technology-2018/>

Agency Leaders' Interests



Blockchain Readiness

- Use Case ID & Applicability
- Governance
- Business Processes
- System Design
- Cost Benefit Analysis

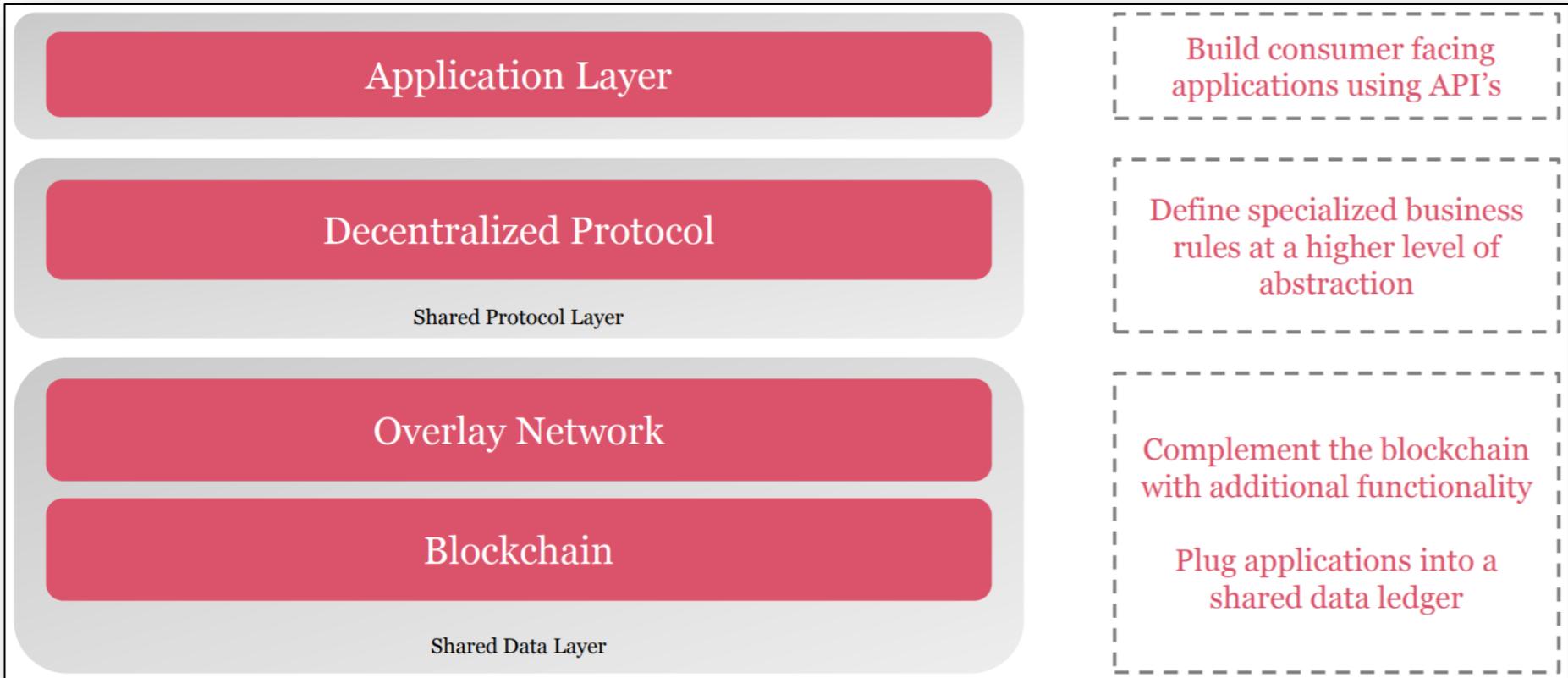


Pilot Programs

- Scope
- KPI Definition
- Engage Stakeholders
- Learn & Iterate
- Migration Planning

The Blockchain Stack

Blockchain is an ingredient, not the recipe.



Blockchain Leadership Considerations

Enrolling the right stakeholders is essential.



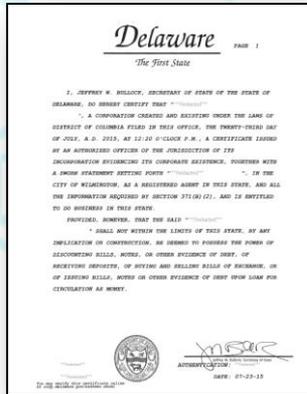
<http://raw.rutgers.edu/docs/wcars/40wcars/Presentations/>

“Good” Blockchain Use Cases

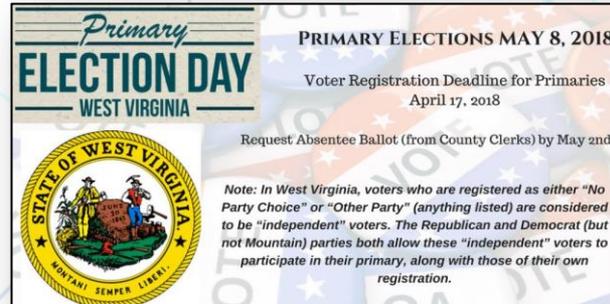
- Multiple Parties, Different Incentives
 - Regulated Boundary Conditions
 - Actionable Shared Data
- Blockchain Adds Trusted Infrastructure for Shared Benefits

Use Case	Examples
Low-Stakes Transaction Management	Crowdfunding, Gift Cards, Loyalty Programs, Gamification, Asset Issuance & Tracking
Supply Chain Tracking	Manufacturing, Logistics, Bill of Materials / Landing, Permitting / Approvals
Recordkeeping & Aggregation Across Institutions	Transferrable Credentials, Identity Management, Medical Records, Land Titling, Back Office Clearing & Settlements

State & Local Use Cases: 2018



July 2018: Delaware awards IBM \$738k for a blockchain-based **corporate filing system**, piggybacked on an existing federal consulting contract.



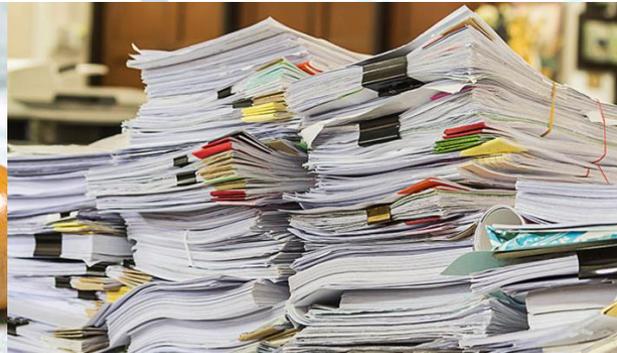
August 2018: West Virginia \$150k pilot with Voatz, **blockchain-powered mobile voting** application, limited to absentee votes for military serving abroad.



September 2018: Dublin, Ohio **Broad Blockchain Initiative** for Identity, Citizen Engagement, and Token-based pilot programs.

<https://www.delawareonline.com/story/news/2018/07/03/state-awards-738-000-single-bid-blostate-awards-738-000-single-bid-blockchain-ckchain-contract-ibm/751001002/>
<https://www.dataprivacyandsecurityinsider.com/2018/08/state-and-local-governments-test-blockchain-applications/>; <https://statescoop.com/meet-the-guy-paying-for-west-virginia-to-run-an-election-on-blockchain/>
<https://www.coindesk.com/an-ohio-city-wants-to-experiment-with-blockchain-technology/>

Other State-Level Use Cases



Permitting & Licensing

Cross-agency data coordination would cut down paperwork and re-work, improving transparency, efficiency, and enforcement, i.e. transportation, business, import/export, construction, and other regulated activities involving multiple parties.

Records Management

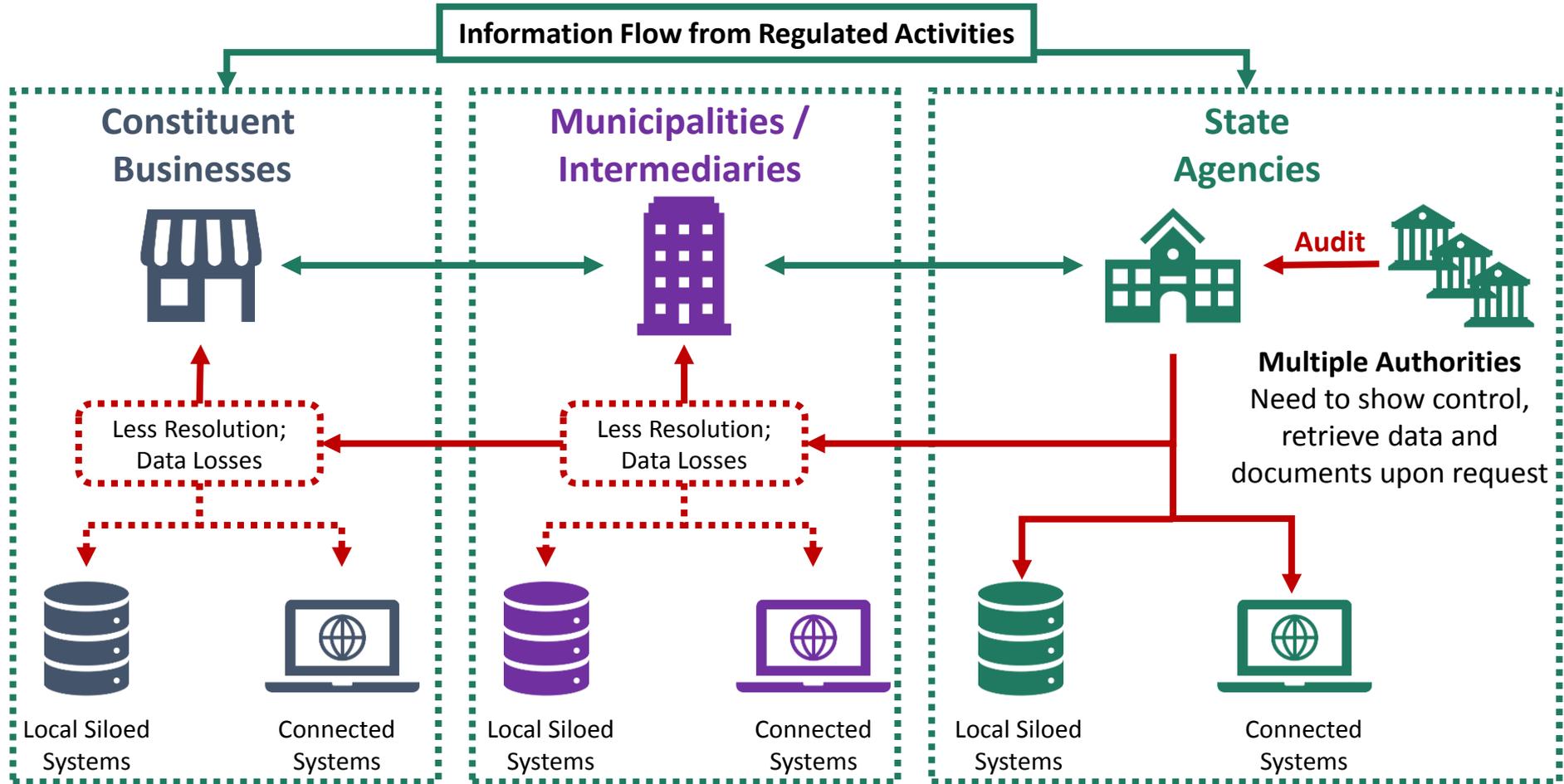
Any records that need to be verified and/or sequentially tracked by multiple parties. Examples include legislative outcomes, taxation, regulated utilities, asset management, lottery, and insurance use cases.

Personalized Services

Identity-based activities, i.e. birth / marriage / death certificates, notary services, voting applications, social welfare, unemployment benefits, and emergency response management / communications.

Multiparty Records Management

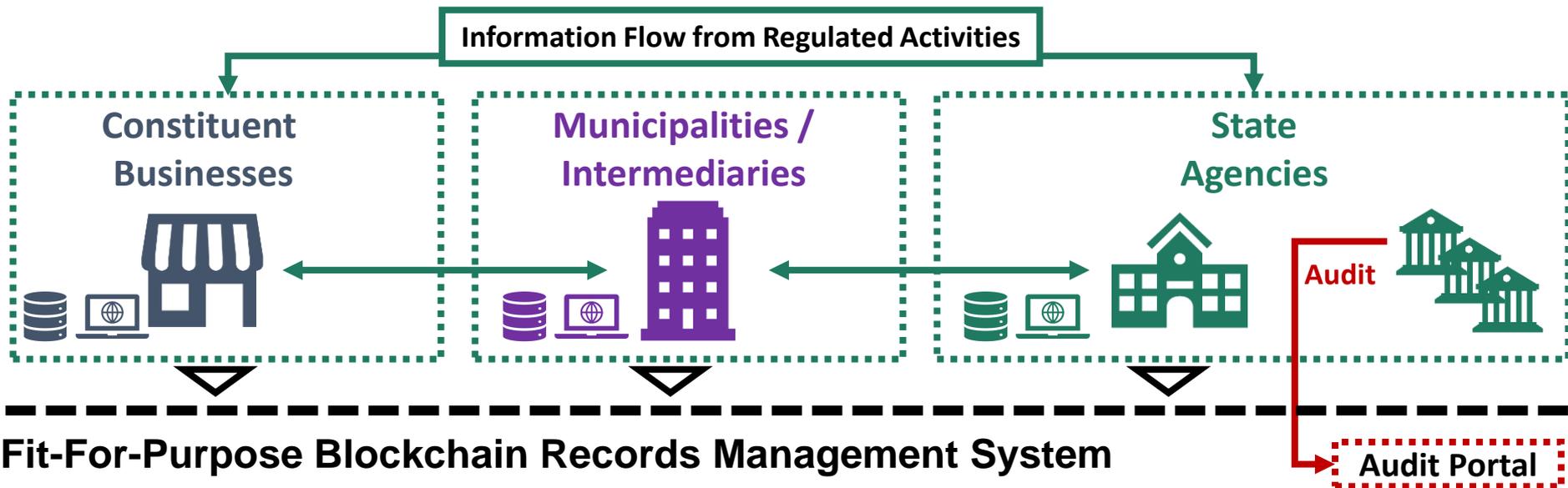
Siloed data causes inaccuracy & inefficiency issues.



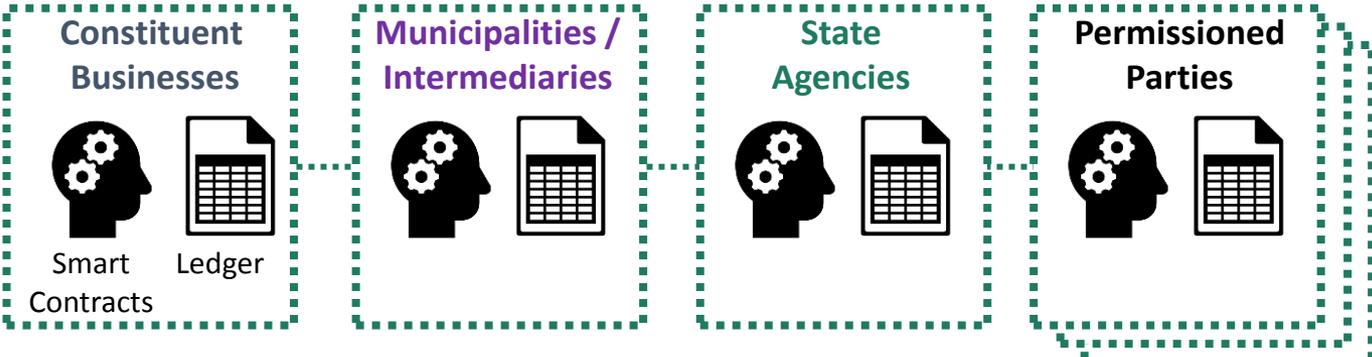
Colvin Run Illustration; Adapted from IBM, "Blockchain/DLT: A game-changer in managing MNCs intercompany transactions."

Multiparty Records Management

Blockchain enables new transparency & efficiency.



Fit-For-Purpose Blockchain Records Management System



Continuously Shared and Verified Trusted Transaction Data

Key Blockchain Benefits

1. Complements existing systems with minimal disruption
2. Continuously documenting interparty transactions
3. Smart contracts enhance system control and compliance
4. End-to-End traceability & trusted documentation for auditing
5. End-to-End visibility of shared data

Blockchain-Based Permitting

1. The Primary Permitting Agency collects data and enables end users to interface with the Verification Engine. The engine manages existing Agency data and generates data Off-Chain with a public/private key system to create a digital signature.

State Agency Dashboard, e.g. VDOT



Legacy Permitting System Off-Chain

2. Adjacent entities maintain Permitting Workflows on their own nodes, i.e. software instances. These nodes connect to the shared infrastructure, with the Verification Engine managing the workflows. The metadata is shared with the agencies, to whom data visibility is provided. This process requires tokenization is needed.

Other State-Level Agencies, or Municipal / Local / Federal Agencies



4. Final Permits are housed by their respective Primary Agency & State, existing "Off-Chain" infrastructure, with ongoing compliance, renewals, and other processes interfacing with the Verification Engine.

Recorded and Reconciled Across Compliance Boundaries



Trusted, Time-Stamped, Matched Records Off-Chain

3. Each Permitting Workflow has its own "Chain" that can enroll the relevant Agencies and State/Local Jurisdictions using pre-approved, agreed governance metadata.

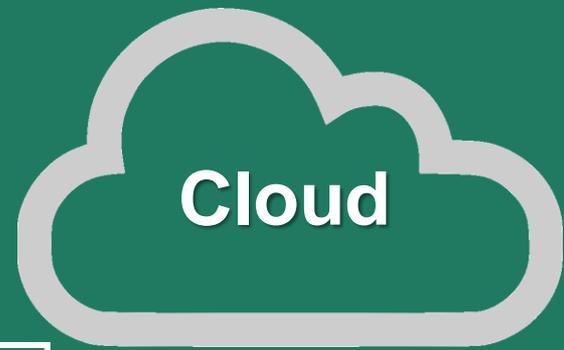


Verified, Rules-Based Activity Data On-Chain

Data



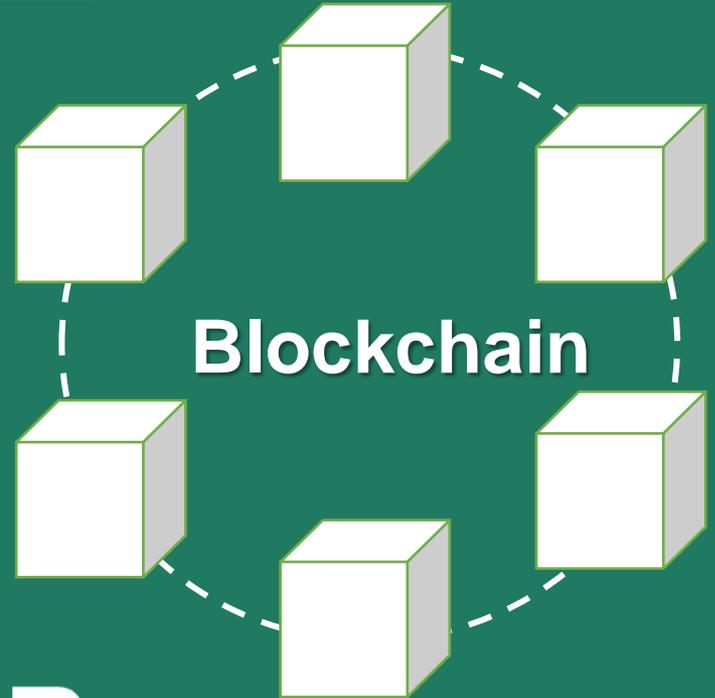
Cloud



Thank You



Transactions



Blockchain



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